

The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 29

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte JOHN T. MARINER and DOUGLAS A. LONGWORTH

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Appeal No. 1999-1136  
Application No. 08/771,373

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ON BRIEF

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Before CALVERT, COHEN, and BAHR, Administrative Patent Judges.  
CALVERT, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1 to 6, all the claims in the application.

As summarized on page 2, lines 9 to 20 of the specification, appellants' invention concerns a flash evaporator vaporization boat made of graphite coated with

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pyrolytic boron nitride (PBN), such a boat being disclosed in the Morris patent, infra. The basic invention is disclosed as residing in the discovery that (page 2, lines 16 to 19):

the useful life of the vaporization boat may be extended by increasing the density of the PBN outer coating in contact with the metal to be vaporized to a density above at least 2.19 gm/cc and preferably between 2.19 gm/cc and 2.2 gm/cc.

Claim 1, the only independent claim on appeal, defines the subject matter in issue as:

1. A flash evaporator vaporization boat comprising:

a graphite body having a recessed cavity and an outer surface coating composed of a high density pyrolytic boron nitride having a hexagonal crystal structure and a density above at least 2.19 gm/cc, wherein the coating is deposited by chemical vapor deposition at a temperature of between 1800° C to 2200° C.

Claims 1 to 6 are reproduced in the appendix of appellants' brief.<sup>1</sup>

The references applied in the final rejection are:

|                              |           |          |
|------------------------------|-----------|----------|
| Basche<br>1964               | 3,152,006 | Oct. 6,  |
| Tanji et al. (Tanji)<br>1989 | 4,849,146 | Jul. 18, |
| Finicle<br>1992              | 5,158,750 | Oct. 27, |

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<sup>1</sup>We note that in claim 3, "the metal to be vaporized" has no antecedent basis.

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Morris 5,239,612 Aug. 24,  
1993

The appealed claims stand finally rejected under 35  
U.S.C.

§ 103(a) as follows:

(1) Claims 1 and 2, unpatentable over Morris in view of  
Basche.

(2) Claim 3, unpatentable over Morris in view of Basche and  
TANJI.

(3) Claims 4 to 6, unpatentable over Morris in view of Basche,  
TANJI and FINICLE.

Rejection (1)

There is no disagreement that the PBN coating of the  
Morris boat has a hexagonal crystal structure, and that it  
would have been obvious to apply the PBN coating using the  
method disclosed by Basche; in fact, at col. 3, lines 10 to  
13, Morris incorporates the Basche patent's disclosure by  
reference as teaching the chemical vapor deposition of boron

nitride.<sup>2</sup> The process disclosed by Basche involves depositing a coating of PBN on a surface by the thermal decomposition and reaction of ammonia with a boron halide (e.g.,  $\text{BCl}_3$ ). At col. 3, lines 40 to 60, Basche discloses that the reactor should be maintained at a temperature of 1450 to 2300° C., and that (col. 3, lines 54 to 60):

The process, however, is very efficient if the temperature of the reactor is maintained between a preferential temperature range of 1850° C. and 2200° C. and especially at about 2000° C. Boron nitride produced within the latter range has a density between about 1.99 and 2.20 grams/cm<sup>3</sup> and is quite stable in water.

In view of this disclosure of Basche, the only difference, if any, between the subject matter recited in claims 1 and 2 and the combination of Morris and Basche is in the particular values of the coating density and the deposition (reactor) temperature.

Appellants argue that the combination of Morris and Basche does not establish a prima facie case of obviousness. We disagree. Since the claimed ranges of temperature and

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<sup>2</sup>Appellants and the examiner agree that the patent number "3,152,226" at col. 3, line 12 of Morris should be "3,152,006" (the Basche patent).

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density overlap the ranges of those parameters disclosed by Basche, supra, claims 1 and 2 are prima facie obvious. See In re Geisler, 116 F.3d 1465, 1469, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997), and cases cited therein; see also In re Reven, 390 F.2d 997, 1001, 156 USPQ 679, 681 (CCPA 1968)("absent a showing to the contrary, discovering particular ranges within a range disclosed by the prior art would be within the skill of the art").

Appellants have the burden of rebutting the prima facie case of obviousness. As stated in In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936-37 (Fed. Cir. 1990):

The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. See, e.g., *Gardner v. TEC Sys., Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir.), *cert. denied*, 469 U.S. 830 [225 USPQ 232] (1984); *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); *In re Ornitz*, 351 F.2d 1013, 147 USPQ 283 (CCPA 1965); *In re Aller*, 220 F.2d 454, 105 USPQ 233 (CCPA 1955). These cases have consistently held that in such a situation, the applicant must show that the particular range is *critical*, generally by showing that the claimed range achieves unexpected results relative to the prior art range. *Gardner*, 725 F.2d at 1349, 220 USPQ at 786 (obviousness determination affirmed because dimensional limitations in claims did not specify a device which performed and operated differently from the prior art); *Boesch*,

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617 F.2d at 276, 205 USPQ at 219; *Ornitz*, 351 F.2d at 1016-17, 147 USPQ at 286; *Aller*, 220 F.2d at 456, 105 USPQ at 235.

As proof of criticality, appellants have submitted the declaration under 37 CFR § 1.132 of John Mariner, one of the appellants (filed Nov. 18, 1997), to show "that high density PBN is superior to low density PBN relative to useful life" (brief, page 8).

Before considering Mr. Mariner's declaration, we take notice of the fact that Basche discloses that the coating process is especially efficient when the reactor temperature is 2000° C. (col. 3, line 57), thereby expressly suggesting to one of ordinary skill that a temperature of 2000° C. be used. According to appellants' specification at page 4, lines 4 to 7, higher density (i.e., at least 2.19 gm/cc) PBN may be achieved by keeping the reactor temperature in the range of 1950 to 2000° C. Therefore, if one of ordinary skill were to coat the boat of Morris using the 2000° C. reactor temperature recommended by Basche it would appear that, according to appellants' disclosure, the coating would inherently have a density of at least 2.19 gm/cc. Inasmuch as the resulting

boat would meet all the limitations of claims 1 and 2, those claims would not be patentable notwithstanding the fact that appellants may have discovered that a boat as claimed therein would have a longer than average life, since it is well settled that "recognition of latent properties in the prior art does not render nonobvious an otherwise known invention." In re Baxter Travenol Labs., 952 F.2d 388, 392, 21 USPQ2d 1281, 1285 (Fed. Cir. 1991).

However, assuming arguendo that the 2000° C. temperature taught by Basche would not produce a coating having a density in the range of 2.19 to 2.2 gm/cc, we do not consider that the declaration of Mr. Mariner establishes the criticality of that range. In paragraph 6 of the declaration, Mr. Mariner describes a test in which two PBN samples, one having a density of 2.19-2.20 g/cm<sup>3</sup> (Fig. B1) and the other having a density of 2.00-2.10 g/cm<sup>3</sup> (Fig. B2), were subjected to a molten aluminum environment for an unspecified length of time. The low density sample (Fig. B2) showed an exfoliated pattern, the same as exhibited by flash evaporators which were tested using aluminum metal charges until failure occurred (Figs. A1, A2 and A3), whereas the high density sample (Fig. B1) "shows

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essentially no penetration of molten aluminum." From this, Mr. Mariner concludes that "high density PBN is clearly superior to low density PBN relative to useful life and is unexpected."

In In re Soni, 54 F.3d 746, 751, 34 USPQ2d 1684, 1688 (Fed. Cir. 1995), the Court stated:

Mere improvement in properties does not always suffice to show unexpected results. In our view, however, when an applicant demonstrates *substantially* improved results, as Soni did here, and states that the results were *unexpected*, this should suffice to establish unexpected results *in the absence of* evidence to the contrary.

In the present case, Mr. Mariner states that the result of his test was unexpected, but in our view there is no demonstration of substantially improved results. At the most, all that the test shows is that the low density PBN failed prior to the high density PBN of the claimed invention. However, there is no indication of how much the life of the high density PBN would be relative to that of the lower density PBN. As far as the test is concerned, it appears that a boat coated with high-density PBN might have a life only one "flash" longer than the life of a boat coated with lower-density PBN; in



other words, there are no test data showing to what extent the life of a high-density PBN coated boat is increased over the life of a lower-density PBN coated boat. Absent such data, there is no basis for concluding that the 2.19 to 2.2 gm/cc range claimed by appellants is critical and yields unexpected results vis-a-vis the 1.99 to 2.20 gm/cc range disclosed by Basche.

Accordingly, rejection (1) will be sustained.

Rejection (2)

At page 9 of their brief, appellants acknowledge that Tanji teaches the use of plural PBN layers, but argue that it does not teach the arrangement of PBN layers recited in claim 3.

We note initially that claim 3 does not require that only the outside layer of PBN be of high density, as appellants seem to assume, but rather is inclusive of structure in which all the layers are high density PBN. Since Tanji discloses that PBN which is vapor deposited at 1850-2100° C. forms a laminar structure (col. 1, lines 35 to 44), having plural layers as shown in Fig. 1, the boat of Morris, coated in the manner disclosed by Basche, would inherently have a layered

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coating as disclosed by Tanji, and thus would meet all the limitations of claim 3.

Rejection (2) therefore will be sustained.

Rejection (3)

Claim 4 reads:

4. A flash evaporator vaporization boat as defined in claim 3 having an intermediate layer between the coating of PBN and said graphite body.

In considering rejection (4), we interpret the recited "intermediate layer" as requiring a layer composed of a substance other than PBN, this being consistent with appellants' disclosure (page 4, line 11 et seq.) and with the apparent interpretation placed on this claim by appellants and the examiner.

The examiner states on page 5 of the answer that appellants' argument concerning Finicle is not persuasive because:

The claimed invention calls for having an intermediate layer such as pyrolitic graphite between a PBN coating and a graphite body. Finicle shows in Figure 1, an intermediate layer such as pyrolitic graphite shown as element 8 provided between a PBN coating and a graphite body. Also, Finicle is in the same field of endeavor which is in the field of using PBN coating to insulated heated vessels or crucibles.

We do not consider this rejection to be well taken. As appellants point out on page 6 of the reply brief, Finicle does not disclose an intermediate layer of pyrolytic graphite between a PBN coating and a graphite body, as the examiner contends, but rather discloses a layer of pyrolytic graphite 8 between a PBN crucible 2 and a PBN coating 10, the purpose of the graphite layer being to control the temperature uniformity or profile of the crucible, which is externally heated (col. 1, lines 45 to 51, and col. 2, line 61, to col. 3, line 13). We find no teaching or suggestion in Finicle which would lead one of ordinary skill to provide an intermediate pyrolytic graphite layer between the body 12 and PBN coating 14 of the boat of Morris, since not only is the body 12 of the Morris boat made of graphite, rather than the PBN of Finicle crucible 2, but also, unlike the Finicle crucible, the Morris boat is heated by passing an electrical current therethrough, rather than being heated externally.

We therefore will not sustain rejection (3).

### Conclusion

The examiner's decision to reject claims 1 to 6 is affirmed as to claims 1 to 3, and reversed as to claims 4 to

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6.

No time period for taking any subsequent action in  
connection with this appeal may be extended under 37 CFR  
§ 1.136(a).

AFFIRMED-IN-PART

|                             |                   |
|-----------------------------|-------------------|
| IAN A. CALVERT              | )                 |
| Administrative Patent Judge | )                 |
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|-----------------------------|---|---------------|
| IRWIN CHARLES COHEN         | ) |               |
| Administrative Patent Judge | ) | APPEALS AND   |
|                             | ) |               |
|                             | ) | INTERFERENCES |
|                             | ) |               |
| JENNIFER D. BAHR            | ) |               |
| Administrative Patent Judge | ) |               |

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